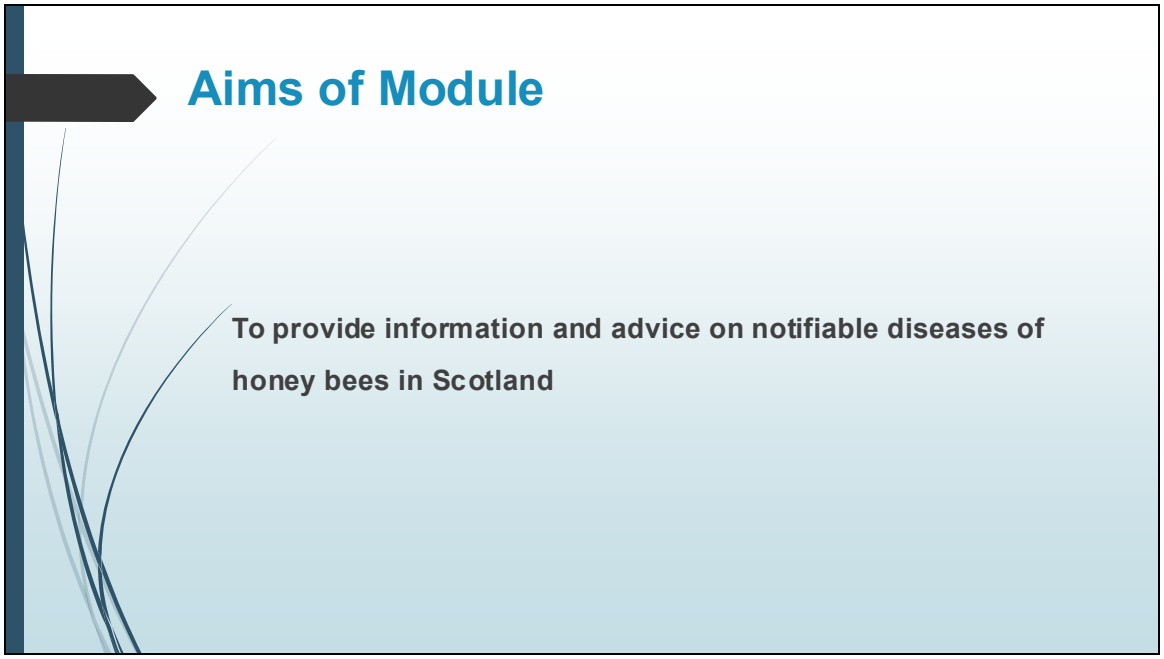
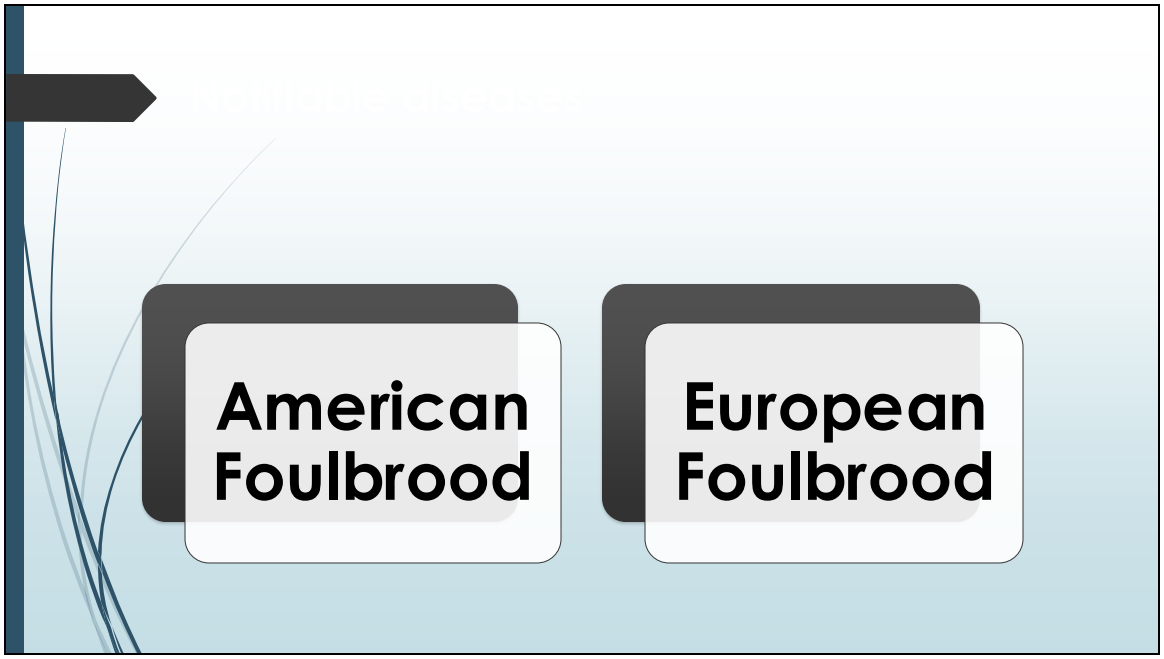
This presentation is part of a suite developed by the Scottish Government and SRUC to provide local associations advice and information on statutory beekeeping requirements, best practice, and how the Scottish Government provides support to Scottish beekeepers.



In this module we will discuss the legally notifiable diseases of bees in Scotland. We will look at their causes, how to prevent, identify and control them, and what to do if you suspect them, including your legal responsibilities.
The Scottish Government aims to educate all beekeepers in Scotland so they are able to identify and report disease at early stages

All beekeepers should be able to:

Know which honeybee diseases are notifiable in Scotland.
Carry out a disease inspection.
Recognise symptoms of notifiable disease
Know how to report suspicion of notifiable disease
Understand the role of SG.



The two notifiable diseases in Scotland are American Foulbrood (AFB) and European Foulbrood (EFB).It is important to understand the difference between a **notifiable** disease or pest, and a **reportable** disease or pest. **Notifiable** means that there is a legal requirement for the Scottish Government to take action when a case is reported, whereas **reportable** only requires the Scottish Government to record it.

Notifiable Diseases and Pests

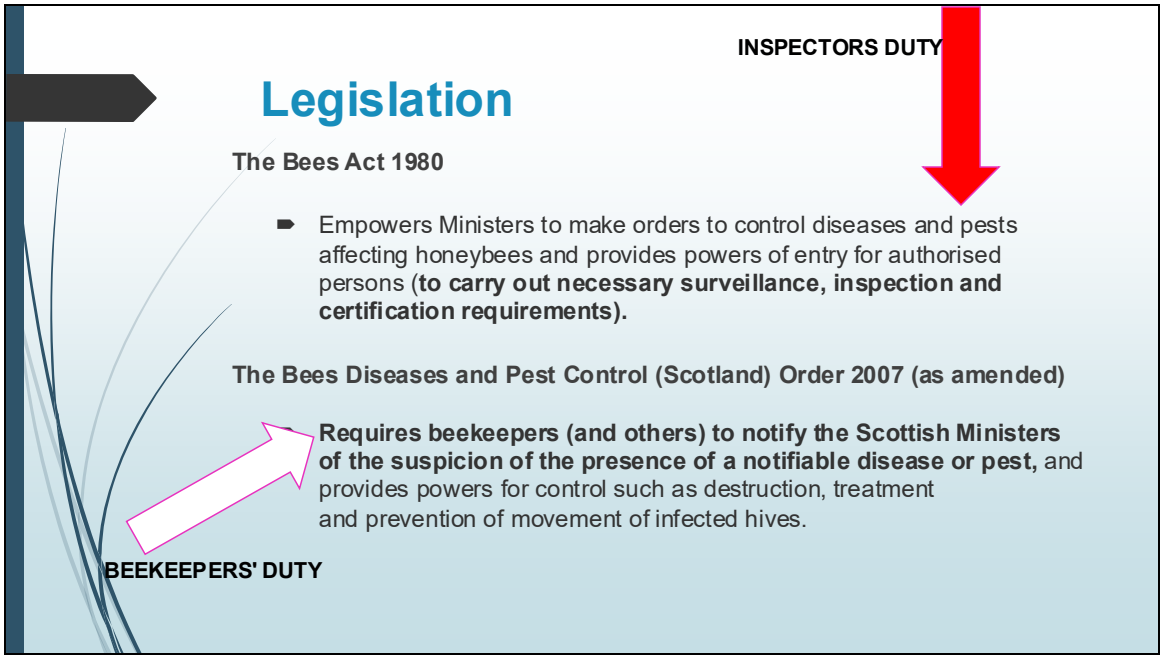
- **The notifiable diseases of honeybees in Scotland are:**
- European Foulbrood (EFB)
- American Foulbrood (AFB)

The notifiable diseases are American Foulbrood (AFB) and European Foulbrood (EFB), the first picture is of EFB and the second AFB

If you suspect a notifiable disease, you must report it to Bees_mailbox@gov.scot immediately. Provide a description, a history of the colony and if possible, photographs, and one of the team will get back to you.

While Lateral Flow Tests (LFTs) may be available from some beekeeping suppliers, beekeepers are reminded that it is a legal obligation to notify the Scottish Government Bee Health Team **on suspicion of** notifiable disease. The purchase and use of LFTs are strongly discouraged – selecting the correct larvae to sample is a specific skill which bee inspectors are trained in; beekeepers are not experienced in recognising notifiable disease and therefore may select the wrong larvae to sample, resulting in a false negative. This can result in the beekeeper believing they are free

from notifiable disease when in fact they are not, risking the disease spreading not only within their own colonies but to their neighbours bees as well.



The Bees Act empowers Ministers to take steps to control diseases and pests of bees, and it gives powers of entry for authorised persons – Scottish Government Honey Bee Health Inspectors – to access premises to ascertain if disease/pests are present, and to take action.

The Bees Diseases and Pest Control (Scotland) Order 2007 (as amended) places a legal obligation on beekeepers to report any suspicion of notifiable diseases or pests immediately. This Act also empowers authorised persons, Bee Inspectors, to take appropriate action to tackle the incident.

This Act also sets out what actions must be taken in the event of an AFB outbreak and sets out the options available for an EFB outbreak.

No other actions are legally permissible and you *must* comply with Inspectors' instructions.

It is important to be able to recognize healthy brood. The pictures on the left show examples of healthy sealed brood in the top picture showing a good brood pattern with biscuit coloured capping's. The bottom left picture shows healthy larvae with pearly white C shaped Larvae with well defined segments sitting neatly in the cells. The pictures on the right show a pepper-pot pattern which should alert you to a possible issue. The larvae in the bottom right picture looks unhealthy with discoloured cells not sitting right in the cells and looking unsegmented and melted. Beekeepers should be able to identify the most common causes of brood and hive disorders. The symptoms of EFB in particular are similar to those of many other diseases as chalk brood or chilled brood. The overall history of the colony, and your experience that enables you to rule out notifiable disease.

However, if you are uncertain if there is a notifiable disease in your hive, contact the Scottish Government Bee Team. The team will

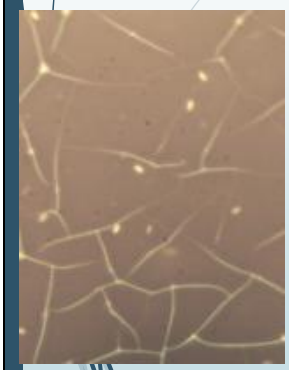
ask questions and triage the case.
It is better to discuss the case, and have it ruled out, than do nothing about a potentially notifiable disease which will inevitably then spread across all your other colonies or neighbouring beekeepers in the area.

What Are The Foulbroods?

- Bacterial diseases affecting brood only.
- Bacterium fed to larvae with brood food.
- Highly contagious within/between colonies.
- Difficult to eradicate.

Foulbroods are highly contagious bacterial diseases. AFB is spore forming and difficult for the bees to remove, it can last decades in old equipment. EFB is also highly contagious but not spore forming so it may be possible for it to be eradicated. It is important that you are able to distinguish foulbroods from other common brood disorders. While you may not have encountered them before and may think that it is unlikely to appear in your hives, you should be aware that they are found in specific parts of Scotland and can spread very easily. You should be aware of the areas of Scotland where these diseases occur. You can find these maps on Beebase. Notify the Scottish Government promptly so that action can be taken via the bees mailbox.

American Foulbrood – what is it?




American foulbrood is caused by the spore forming bacteria *Paenibacillus larvae.* Infected larval brood usually die at the pre-pupal or pupal stage, after the cell has been capped, as seen in picture 2. Picture 3 shows the matchstick test where the remains rope when pulled out. Once the decomposed larvae desiccates. It creates a scale like formation on the cell that is difficult to break which we can see in picture 4. This scale is full of spores that transmit the disease, and the bees are unable to remove it. The queen will not lay in these cells.

AFB spores can remain viable for over 50 years and are very resistant to freezing and high temperatures. Often an outbreak can be traced to the re-use of old equipment which was infected. You are therefore urged to be extremely careful when using second-hand equipment.

The second and third pictures show some of the symptoms of AFB and we will look at those in more detail on the next slide.

the bees, it seems to be easier for us as beekeepers and inspectorate to control and manage (by destruction we control it) than EFB.

AFB – how does it transmit?

- Beekeeper:
  - Poor biosecurity.
  - Reusing old equipment.
  - Moving frames.
- Bees:
  - Robbing.
  - Drifting.
  - Swarming

AFB is most commonly spread by the beekeeper. The indestructible nature of the spores relies on poor biosecurity to be introduced into new combs. It can linger in hives for decades and old equipment is a common source. Reusing old equipment and moving frames around are the most usual ways that AFB is spread.
The bees can carry the spores in their mouth parts – it is therefore easily spread by bees robbing out an infected colony which is weak and dwindling and the bees bringing back the bacteria to their own colony. It can also be spread by drifting in the same way, so it is important to think about the direction of hive entrances.
Occasionally the spores can be spread via swarming but this is not common – this is because when a colony is infected with AFB it is usually too weak to swarm.
Spores will attach to equipment and be transferred by beekeepers. At its worst, the disease will weaken and kill the colony. It does not distinguish between strong and weak colonies and is extremely

Often an outbreak can be traced to the re-use of old equipment which was infected. You are therefore urged to be extremely careful when using second-hand equipment.

AFB Symptoms

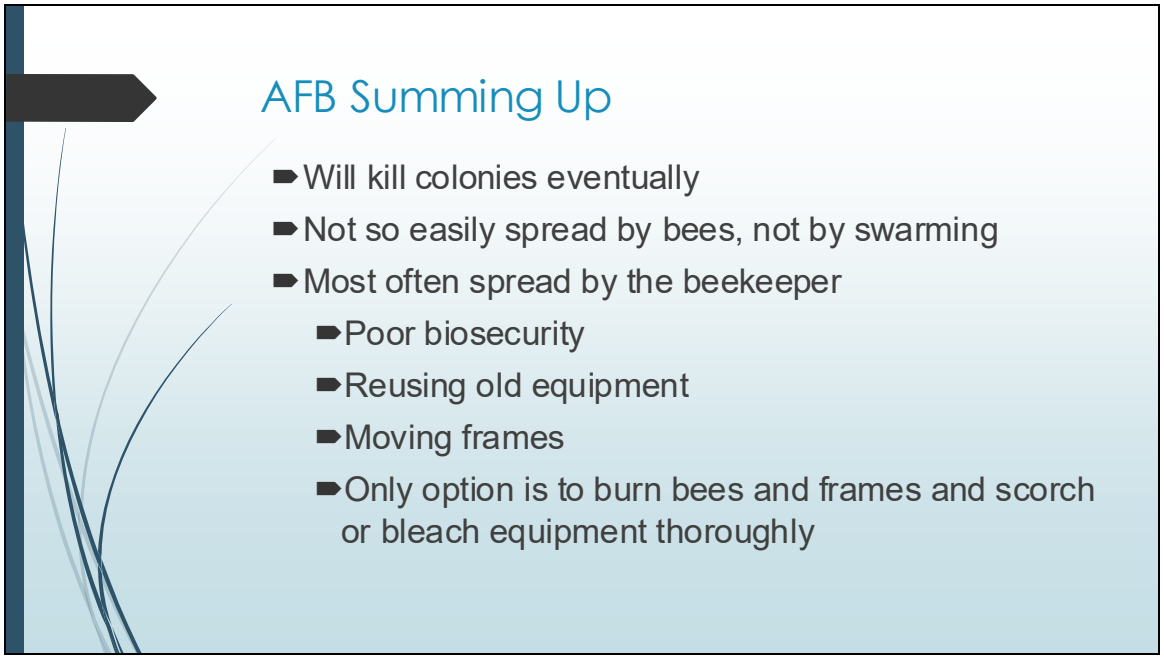
- Sunken, greasy cappings.
- Roping.
- Scale.
- Perforations often at side of cell after cell is capped.

Picture 1 shows a fairly early presentation of AFB. You can see the cappings mostly appear to be biscuit coloured and healthy in appearance. There was just the occasional pin prick perforation at the side of the cell that alerted the bee inspector that something was wrong in this case. Not all symptoms will be present in all cases, and anything that kills the larvae on the cell (starvation/chilling/neglect) will lead to the larvae to decompose and create a brownish product at the bottom of the cell, but this is different in texture and appearance to that of AFB.
Common AFB symptoms are greasy sunken cappings, pepper pot brood pattern, and as you can see in picture 2, what we call “roping”. Roping is a pathognomonic (specific) symptom of AFB, if you insert a matchstick into the capped cell and you get a glue- like substance that stretches, this should make you very suspicious of AFB

AFB Treatment

- There is no legally permissible treatment of AFB.
- Any items infected with or in close contact with AFB (bees, brood, frames) must be destroyed and hives sterilised

Unfortunately, there is no cure or treatment for AFB. If that is diagnosed in your hive you must, under the instruction of the Bee Health Inspectors, destroy the colony and frames in order to avoid the transmission of the infected spores. You must then sterilise the Hive by scorching for wooden hives and submersion in bleach for poly hives. You can find instructions on BeeBase



AFB spores can survive many decades and linger unknown. Old equipment should be thoroughly disinfected before use. Old frames and wax should be burned. Good biosecurity practices should be used.

European Foulbrood – what is it?

European foulbrood or EFB is caused by *Melissococcus plutonius* bacteria. It is more prevalent than AFB in Scotland.
Larvae of all ages are susceptible to infection and become infected after ingesting food contaminated with the bacteria. The bacterium then multiples in the mid-gut of the larvae and competes for larval food, resulting in the larvae dying of starvation.
Strong colonies may have the bacteria present, but live with it in small quantities – the bees can remove infected larvae. The incidence of EFB is generally higher when the colony is under stress, which may be caused by hive movement, beekeeper manipulations, climatic conditions such as cool and wet weather conditions, or poor nutrition. Heavy infestations will affect a large percentage of the brood, weakening the colony over time, and possibly leading to the death of the colony. The first picture shows the bacteria under a high-powered microscope.
The second picture shows the larvae, discoloured and the stomach a pale yellow as opposed to a bright yellow or orange gut. A pearly white segmented larvae, would be healthy. The third picture shows the larvae melted in the cell, twisted, discolored with no segmentation. The last picture shows the remains of a larvae affected by EFB. This can sometime be

dark and gloopy but when you try the rope test we referred to in the AFB slides, it will break. These remains can be cleaned out by the bees, but this also helps the bacteria spread through the hive'it will break. It can be removed by the bees but this also helps it spread through the hive.

EFB – how does it transmit?

- Easily spread by bees:
  - Swarming.
  - Robbing.
  - Drifting.
  - NOT by foraging in same area.
- Easily spread by beekeepers:
  - Poor biosecurity.
  - Moving frames.
  - Extraction equipment.

It is important to take preventative measures to lessen the chance of spread. For example good swarm control, hive and entrances further apart and facing different directions. Good biosecurity is also essential and if you are in an area where there is disease do regular disease checks. The SRUC Bee Advisor Lorraine Johnston has written a document on how to clean your shared extractor in order to prevent transmission. Contact her for a copy.

EFB Symptoms

- Discoloured, yellow/creamy larvae.
- Twisted in cell.
- Melted, lost segmentation.
- Uncapped larvae.
- Foul smell in later stages.

In a light infestation of EFB there may be only one or two cells in the entire colony but it is essential to report this as early diagnosis can reduce chances of it spreading. In advanced stages there is a higher percentage of infected cells and the larvae will be more melted and go darker and there may be a smell. The larvae are typically not the usual creamy white with clear segments sitting perfectly in the cells. They are often discoloured in the early stages looking a yellowy creamy colour and in later stages they can look very melted with no segmentation visible and becoming rotten with a foul smell. It happens in the early stages of development of the larvae, before capping. You can sometimes see with an expert eye the discoloured gut in the larvae. The larvae also sits twisted or melted in the cell rather than the plump larvae filling the cell.

EFB Treatment

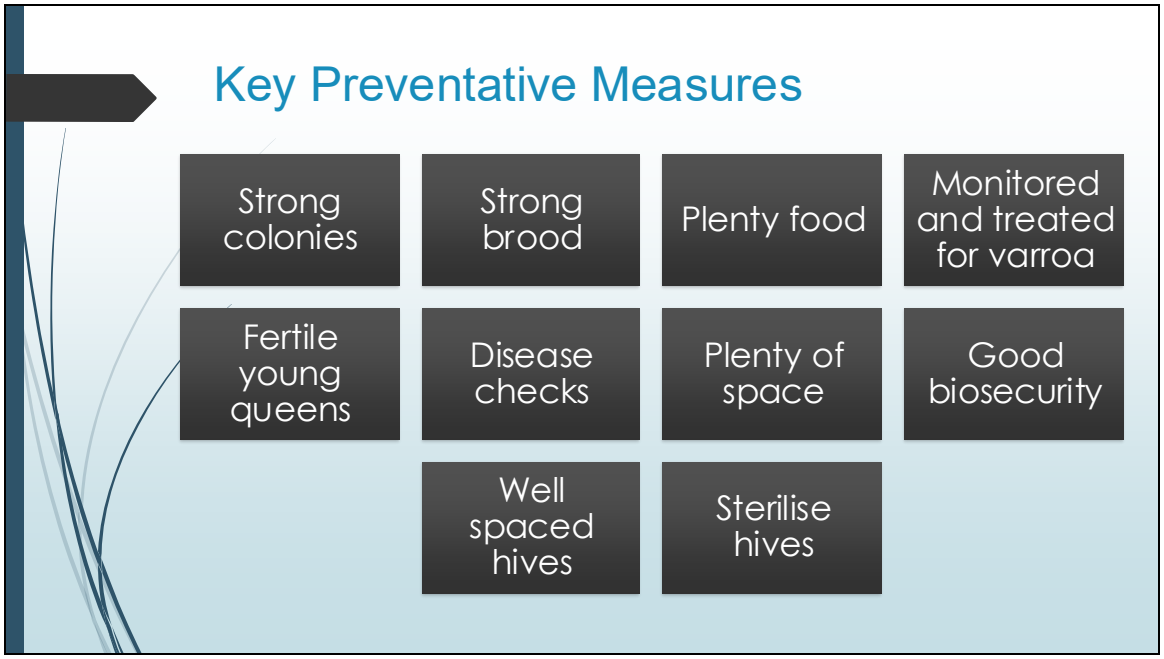
- Shook swarming
- Destruction

If your hives are diagnosed with EFB, the Bee Health Inspectors will tell you what action you need to take.
If the colony is deemed to be weak, or there is a high level of EFB infection, you will be instructed to destroy the brood. However, strong colonies, or those with a low level of infection may be treated with a shook swarm. Some beekeepers may decide to take a stronger approach and destroy the infected hive and shook swarm the others in the apiary, as there is evidence to support this reduces the risk of disease recurring in the other colonies

EFB – Summing Up

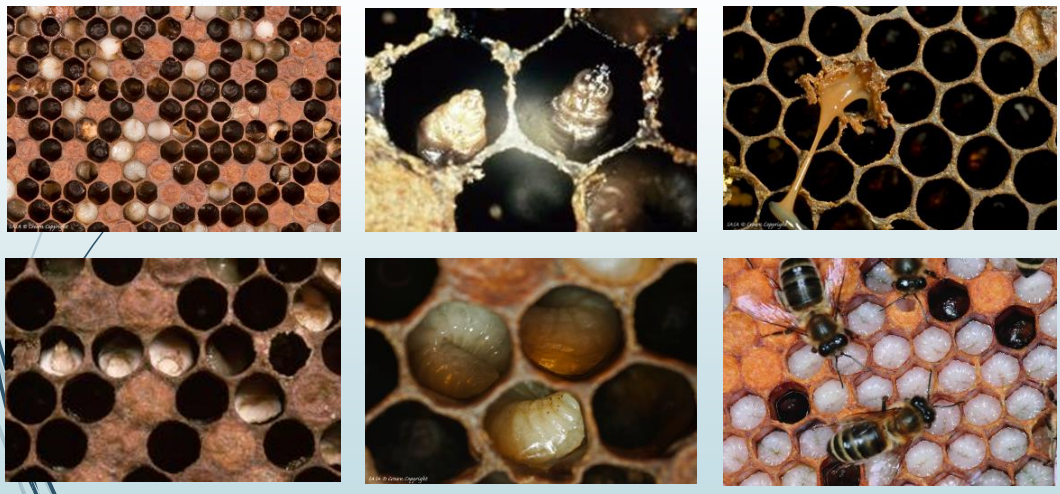
- Doesn't always kill colony.
- Stress disease:
  - Lack of stores.
  - Splits.
  - Swarming.
- Easily spread by bees:
  - Swarming.
  - Robbing.
  - Drifting.
  - NOT by foraging in same area.
- Easily spread by beekeepers:
  - Poor biosecurity .
  - Moving frames.
  - Extraction equipment.
- See BeeBase for live EFB info in Scotland

A colony can survive a light infection but will not fully recover and this risks it spreading to other hives. It can be sub-clinically present in hives and you may not see clinical signs until the colony is under stress. Stress could be caused by lack of forage, poor weather, splits, swarming and other pests and diseases. EFB is spread by beekeepers and by swarming and robbing so there are preventative measures you can take such as good husbandry and hygiene. It is a good idea to take extra measures such as spacing hives out, different directions, being wary of swarms especially if you are in an area where EFB is present



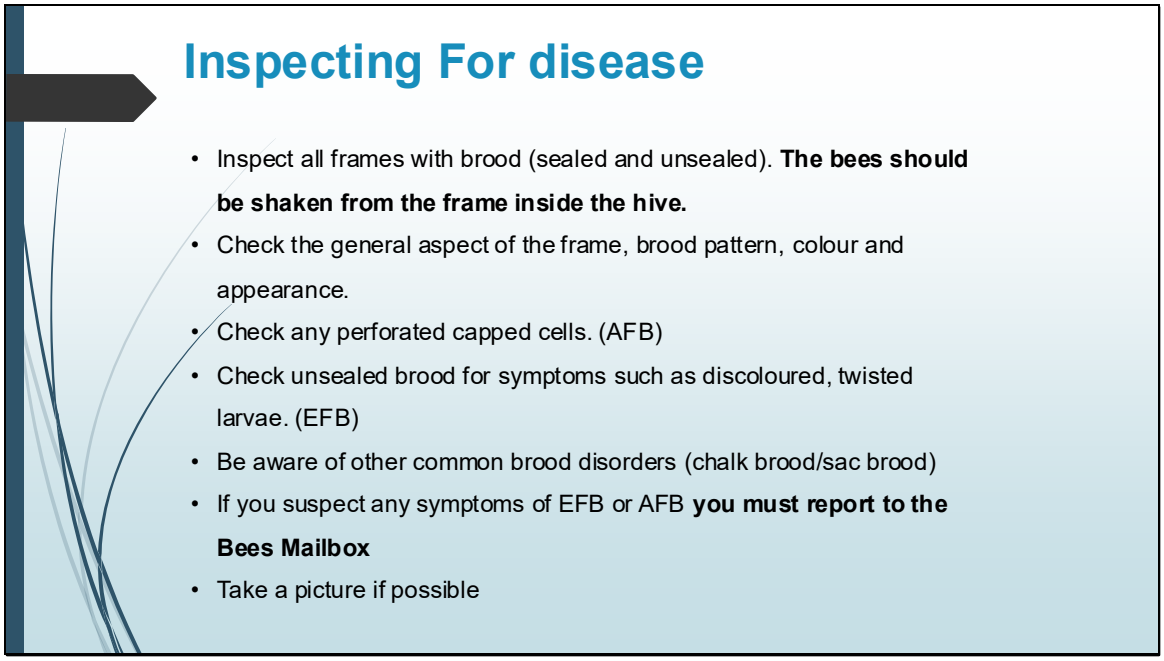
You can lessen the risk of getting EFB. Keeping strong colonies with a young queen and strong healthy brood will keep any sub-clinical EFB at bay. Making sure that varroa is under control will also help as it would weaken the bees and make them more susceptible to other issues. Doing at least two disease checks a year and regular inspections will help you catch any issues early. Well spaced hives will help avoid drifting and robbing and as always good biosecurity and not sharing frames or honey from other hives can also prevent spread. Does any one have any other tips that may help?

Disease Recognition



Here we have a number of different potential diagnoses in these photos. Can you identify a potentially notifiable disease here?
EFB, Sacbrood, AFB, Chalkbrood ,EFB, healthy brood
(The message here is that beekeepers need to be able to recognise healthy brood from unhealthy brood, but also, be able to differentiate “common” issues with notifiable diseases.)
Common issues include:
Sac brood
Chalk brood
Neglected brood (chilled)
Starvation
Varroa damage
Humidity and mould growth
Mice damage
Wax moth
Queen failure

Drone layers
Etc..



Finding disease requires skill and experience. It should be easy to see disease if it is so advanced that the entire colony is infected with high levels of affected larvae, but by that stage, disease will be most likely spread across the rest of your colonies *and apiaries.* You want to be able to identify symptoms as early as possible so that you can call in the Bee Health Inspectors to undertake an inspection and confirm whether there is EFB or AFB present.
Shake the bees from the comb and have a close look at it. Does it look healthy? Is there a good brood pattern across the frame? Are there any cells which have an appearance other than the healthy "biscuit colour" you expect to see? Are there any uncapped larvae which don't look pearly white and in a C-shape? Do capped cells appear to be discoloured, sunken and greasy? Is there a sour or unpleasant odour?
How does the colony appear? Does it appear sluggish and with unmoving bees, or are the bees moving easily and freely? How

does this comb appear by comparison to others in your apiary?
If you have any suspicion at all, take a photograph and provide a description and then you **must** contact the Bee Health Team via the bees mailbox

What To Do If You Suspect Notifiable Disease

Bees_mailbox@gov.scot

- Triage questions
- Inspection arranged

Always contact the Bee Health Team if you have any doubts about the appearance of your colonies.
Email the mailbox which is checked during office hours Monday to Friday.
If you suspect disease, close the hive, reduce the entrance of the hive to avoid potential robbing, change your gloves, clean and disinfect your tools if you must continue inspecting other hives, ideally, if strong suspicion of disease being present, stop the inspection to avoid spreading the disease.
The inspectors are a friendly bunch who want to help you, but bear in mind they receive many calls and reports and during the season they will need to triage the calls. Most calls thankfully are not notifiable diseases but common brood disorders. This is ok. It is better that you call out the Bee inspectors and they can rule it out, than you not calling and sitting on an infected hive that has an impact on not just your hives, but those of your neighbouring

beekeepers. Please act responsibly.

Keep Updated With Notifiable Disease Alerts In Your Area

- Keep your apiary locations up to date.
- Locality-based notifications through:
  - BeeBase
  - Local Associations

As we have previously seen, the best way to keep up to date with outbreaks of EFB and AFB in your area is to register on BeeBase. Accurate data about hive locations is the best tool we have to help track and manage outbreaks.

When the Bee Inspectors find AFB or EFB, they will alert the local beekeeping association, but they will also issue targeted notifications through BeeBase to registered beekeepers in a 3km radius of an infected hive. But of course, you will only receive those targeted notifications if your hive locations are kept up to date so please help us help you by ensuring your apiary records and contact details are up to date.

If you are not registered on BeeBase and you are not a member of your local Association, then Bee Inspectors will not be able to let you know about a potentially devastating outbreak in your area. So be a responsible beekeeper and register on BeeBase and keep your information up to date.

BeeBase also has a wealth of information for beekeepers on notifiable diseases and pests, hive hygiene and biosecurity, factsheets on beekeeping best practices, latest disease occurrences – it is well worth a look.

Biosecurity and Good Practice

- Clean and disinfected equipment
- Clean suits
- Gloves: disposable or can be cleansed and disinfected between hives
- Visitors to apiary premises
- Vigilance for diseases and pests – inspect twice per year
- Practice good swarm prevention and management

Good biosecurity is paramount. Given the multitude of ways by which pests and disease can spread, through movement of package bees, honey bee colonies, honey bee swarms, honeycomb, beeswax, beekeeping equipment, soil and fruit, or movement of alternative hosts (e.g. bumble bees) – it is critical that responsible acquisition, sale, movement and management of bees and related products are fundamental to beekeepers. Clean and disinfected equipment Always clean and disinfect equipment between hives and when moving them, and particularly before using any second hand equipment.
Clean suits
Always have a clean suit on each time you go out to the bees. Gloves Should be either disposable and replaced between each hive, or can be cleansed and disinfected Visitors to apiary premises. Ensure that visitors practice the same high levels of biosecurity you do: clean suit, clean boots/shoes/ clean or disposable gloves Twice annual inspections You should be vigilant every time you check a hive, but carry out a detailed inspection twice per year. Good bee management Swarming bees can spread disease. Make sure your bees don't swarm and be careful of introducing swarms to apiaries. Avoid robbing in your hives. More information on biosecurity can be found in the responsible beekeeping presentation.

Always investigate dead-outs in Winter and clean out and disinfect any dead-out hives.

Biosecurity and Good Practice

- Register on BeeBase and keep your apiary details updated
- Source bees and equipment responsibly
- Report suspect notifiable diseases and pests immediately
- Co-operate with Bee Health Inspectors

Source bees and equipment responsibly:
Bees or bee by products can only move between Member States if accompanied by a valid health certificate. The UK has not permitted the import of colonies of bees or package bees from Third Countries (outside the EU) for many years. EU legislation now prohibits (with the exception of New Zealand) imports of package bees or colonies from Third Countries. **Although the Northern Ireland Protocol allows movement of bees from Northern Ireland into GB with unfettered access, NI remains part of the EU, so bees can move to Northern Ireland from the EU, and subsequently to GB. This is legal under the current trade arrangements.**
Queens can still be imported directly into the UK from the EU and third countries. Check with policy make easier to understand

Here are some of the Government and SRUC resources available to you. If you have any queries you can contact the Honey Bee Health Team by email.
Information about how the Scottish Government supports honey bees in Scotland can be found via the QR codes or link
SRUC podcasts on honey bee management can be found using the QR code.

Here are some of the Government and SRUC resources available to you. If you have any queries you can contact the Honey Bee Health Team by email.

Resources Available – Others

Scottish Beekeepers Association

Bee Farmers Association

Here are links for the SBA and BFA

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